

# Basin aerial acrobats: dragonflies and damselflies

While walking around the small, aquatic basin near the Central Cafeteria, it's easy to miss the graceful, speedy movements of a myriad of dragonflies and damselflies. Yet, with some heightened vigilance, one of the Lab's smallest inhabitants is within eyesight. Startlingly intricate designs, vibrant colors, and awesome acrobatic moves reward the keenly focused eye.

## California diversity

Both dragonflies and damselflies comprise the insect order known as *Odonata* (meaning toothed jaw), although dragonflies belong to the suborder *Anisoptera* (unequal-winged) and damselflies to the suborder *Zygoptera* (yoke-winged). California is home to more than 60 of the over 5000 extant species of dragonflies and damselfies; yet, these 60 species represent all seven families that occur across the U.S.

## Dragonfly, damselfly differentiation

At the basin's edge, these aerial artists are commonly found; yet, is it a dragonfly or a damselfly? A simple way to distinguish one from the other is to compare the two while at rest. The dragonfly will keep its wings out flat, while the damselfly will hold its wings over its abdomen. The larvae of both species are strictly aquatic, damselflies have featherlike gills at the end of their abdomen; dragonflies don't. Other variables also differentiate the two insect groups. The heavier bodied, larger, and stronger fliers typically are dragonflies; while damselflies are smaller, more slender, and weaker fliers. Despite their differences, both insects are commonly and collectively referred to as dragonflies.

## Tandem courting

It's not unusual to catch a glimpse of a dragonfly pair clutched together in flight above the water's surface. This unique and complex ritual offers a fascinating glimpse into their breeding behavior. Surprisingly, even insects are territorial and males may defend an area in anticipation of mating with a female (often termed resource defense territoriality). Males may also gather together — perched in vegetation — awaiting females or actively scout for their partner by flying up and down the water's edge or within the adjacent vegetation. Although females spend much time



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Although a number of species occur at the basin, two species commonly seen include the (above) flame skimmer dragonfly (*Libellula saturata*) and (top right) the bluet damselfly (*Enallagma civile*). The dragonfly flame skimmer is a large species (52-61 mm in length; wingspan of 85-95 mm) that is active aerially from April to November. As the photo demonstrates, its vibrant red-orange coloration makes it easy to identify. The familiar bluet is smaller (25-35 mm in length). This species may be seen tandem ovipositing on plants that float at the surface (active aerially from March through November). Lower right: A mating embrace.

away from water, they return for mating.

Upon finding their mating match, the dragonflies fly in a tandem pair to a perch. This tandem consists of the male clasping the female by the head and flying with the male in front and the female following. If lucky, you'll then see the mating "wheel" formation (see photo), in which the female bends her abdomen forward and downward to connect with the male's genitalia for an equally complex sperm transfer to occur. Mating may last in this position for several seconds to hours (species specific). The subsequent egg

laying (ovipositing) may occur with the male and female remaining in tandem, with the male hovering over the female, or by the female alone. The basin provides frequent opportunities to spot females hovering over the water surface and repeatedly dipping into the water's surface with their abdomen to oviposit.

## Hatching and hunting

The period at the end of this sentence is about the size of most dragonfly eggs; hatching occurs weeks later. Unlike most helpless bird hatchlings, dragonfly parents do not fend for nor feed the larvae (nymphs) that emerge from these minute eggs. Yet, dragonfly larvae are precocious aquatic predators. Not fussy eaters, their underwater crawling results in opportunistic stalking, hunting, and ambushing of prey, eating any animal their size or smaller. Even a sizeable meal of small vertebrates like tadpoles, fish fry, or other dragonfly larvae may make up this random menu. Similar to birds, the larvae undergo molting (or "instars") and will molt about a dozen times over the months or years needed before crawling out of the water to emerge as an adult. The larvae undergo direct metamorphosis to their adult life stage.

## Metamorphosis: a brief adulthood

Seemingly out of a horror movie, metamorphosis is spellbinding (see photo sequence). Once perched (perhaps on a branch or rock) out of the water, the "skin" over the larva's thorax cracks and the adult, winged dragonfly slowly emerges out of this broken shell. Over a matter of hours, it's legs harden, body and wings expand, mature and harden, and colors fully develop. A glassy sheen to the wings indicates a new ("teneral") adult. The new adult is then mobile.

Their showy designs and colors, belie attributes that go far beyond their shell-deep beauty. Adults use their keen eyesight and quick aerobatic agility to hunt their insect prey. Although flight speeds may reach up to 25-30 mph, average cruising speeds for basin species are nearer to 10 mph. Adult dragonflies tend to have a short lifespan (weeks to months). This brief aerial adulthood allows for feeding, maturation, and mating. Similar to migratory birds, a few dragonfly species may disperse over great distances, even across oceans. However, many more remain closely tied to their larval habitats (site fidelity).

## Folklore aside

Some believe that these "toothed jaw" or serrated jawed insects may sting or bite humans, but this is merely a tale. Yet adult dragonflies are fearsome predators to other insects. These aerial predators with voracious appetites provide the benefit of keeping pest insects in check (for example, gnats and mosquitoes). Conversely, dragonflies constitute a key part of the basin's amphibians' diets, like the federally threatened California red-legged frog (*Rana aurora draytonii*).

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Metamorphosis from larva to adult (Widow skimmer, *Libellula luctuosa*): 1) larva thorax splits, 2) adult begins to metamorphose, and 3) newly emerged adult.